DOCUMENT RESUME

ED 208 725 HE 014 367

AUTHOR Simpson, William A.
TITLE Faculty Average Salary Comparisons: How Valid Are They?
PUB DATE [81]
NOTE 28p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Rank (Professional); *College Faculty; *Comparative Analysis; Departments; *Evaluation Methods; Higher Education; Institutional Research; *Multiple Regression Analysis; Research Problems; Statistical Analysis; Teacher Qualifications; *Teacher Salaries

ABSTRACT

Conclusions one would make from looking at average faculty salaries in a specific department were compared with those conclusions evolving from a regression analysis of the same salaries. The standard salary study does little more than report the average salary associated with each faculty rank within each department, while a regression study takes into account the qualifications of all the involved faculty. The comparison of the two approaches reveals contradictions, an indication that faculty are not homogenous in background, that such differences do not average out across a department, and that the results of the regression analysis are in some instances drastically different from results derived from average salaries. The results suggest that the comparison of average salaries may lead to completely erroneous conclusions about the adequacy of an individual's or even an entire department's salary level. The results also indicate a need for further study, particularly one that would use a larger and possibly more homogeneous department such as economics or mathematics. Given the current emphasis placed on salary equity and the penalties for unexplainable differences, the results suggest that perhaps the additional effort required by a regression analysis is not unwarranted. A simple exchange among institutions listing only four pieces of data (rank, department, academic year equated salary, and time in rank for each unidentified faculty member) could support a regression analysis that would be far more accurate than the use of average salaries. (SW)

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FACULTY AVERAGE SALARY COMPARISONS: HOW VALID ARE THEY?

William A. Simpson
Associate Professor
Office of Planning and Budgets
Michigan State University

HE 014 367

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Abstract

Academic administrators make frequent use of established salary studies to assess annually their own faculty salaries and make needed adjustments. How appropriate is such a procedure? The standard salary study does little more than report the average salary associated with each faculty rank within each department. Are these averages invalidated by the wide range of faculty qualifications underlying them or does some type of averaging effect take place to eliminate this as a source of variance? This paper approaches the question by comparing a typical average salary study for a department with a regression study that takes into account the qualifications of all the involved faculty. A comparison of the two studies discloses many striking contradictions--an indication that faculty are not homogeneous in background and that such differences do not average out across a department. Given the current emphasis placed on salary equity and the penalties for unexplainable differences, the results reported here suggest that perhaps the additional effort required by a regression analysis is not unwarranted.

Faculty Average Salary Comparisons: How Valid Are They?

Introduction

The adjustment of faculty salaries is a vexing and never ending problem at every institution of higher education. Within an institution there are pressures for salary changes arising from salary comparisons made between individuals and between entire departments. Simultaneously, external pressures are exerted by the academic market place whenever peer institutions openly vie for newly credentialed faculty or compete on a more subtle level for established faculty. Not infrequently these external and internal pressures work in opposition and it is at these times that the harassed administrator looks about for some benchmark which may aid in adjudicating conflicting claims. These forces pressing for some type of annual salary adjustment cannot be ignored; the influence of the internal and external academic market place is inexorable and must be accommodated in some way at some time. Most administrators recognize this and attempt to avoid the inevitable penalties of lost faculty and missed opportunities by continually monitoring their institution's competitive position and making necessary salary level adjustments at least once annually. Such a process commonly involves the use of one

or more published salary surveys. The most general, but all inclusive, salary report is published each year by the AAUP (American Association of University Professors) using salary information collected through the federal HEGIS (Higher Education General Information Survey) survey. This is a highly aggregated report, essentially giving only the average institutional salary for each rank and thus provides only a general institutional benchmark. In addition to the AAUP report, most administrators rely on other surveys which contain detailed salary information about a more homogeneous group of institutions. Examples of the latter would be the departmental salary report published by the National Association of State Universities and Land-Grant Colleges (NASULGC) for its 76 member institutions or a similar report circulated among the 23 state-supported AAU universities. In addition to these examples, there are innumerable surveys that pertain to institutions within some regional area or having an affiliation. From such reports, every administrator has some guidance as to the prevailing salary level for each rank, in every discipline, within some group of fairly homogeneous peer institutions.

The primary purpose of this paper is to explore the validity of such salary studies. This is done by comparing one such study to a more sophisticated salary study which uses regression analysis. First, however, it is useful to examine a typical salary survey, the type of report that is usually developed from the collected data, and the nature of the conclusions drawn from the report.

A Typical Salary Survey

By far the most useful surveys are those which, at the minimum, display the average salaries by rank within each recognizable department or academic unit. In addition, it is common practice to report the number of faculty salaries comprising each average (in terms of headcounts or full-time equivalent faculty), in order that the data may be aggregated into different combinations by any user. Frequently, some upper and lower limits, such as the high and low salaries, are provided as well as another measure of central tendency such as the median salary. Unfortunately, the most useful statistical measure--the standard deviation within each department rank--is rarely exchanged. This is a considerable loss and one which is responsible for many of the problems surrounding the interpretation of the data. When these types of salary reports became accepted practice a decade or two ago, much of the data was calculated and transcribed onto the report forms by hand. At that time, a requirement to calculate standard deviations would have been detrimental to the goal of encouraging wide participation in a survey. Today, however, most established survey data is generated in finished form by computer and a requirement for standard deviations could be easily accomplished; the continued absence of this vital measure must therefore be a matter of either oversight or disinterest on the part of primary users of such data who feel unsure of how such a statistical measure is properly used.

Table 1 is an example of the type of form used to exchange such information. Formats will surely vary from survey to survey

but they all bear a close resemblance with respect to the types of data required. A stranger to these matters would be surprised by how little information is exchanged after more than a decade of development. To understand the reason for this, one would have to recall the atmosphere of extreme secrecy surrounding faculty salaries that once prevailed even among colleagues within the same department. The requirement to make salaries open to the public at state-supported institutions has greatly attenuated this sensitivity; however, even today, most institutions require some assurances that exchanged salary information will be handled on a need-to-know basis and that any comparison of institutional averages will disguise the identity of the participants. Some residual nervousness exists and makes it difficult to muster much enthusiasm for more detailed and disaggregated exchanges of salary information. Another factor underlying the apparent lack of progress in this area is the problem of coming to agreement on the definition of terms. The data exchanged appears to be self-explanatory, but this is deceptive. Such questions as-- Who are the faculty? Should part-time faculty be included? Where should we place faculty holding joint appointments with several departments? What about faculty being paid from grant funds? Should faculty holding administrative posts be included? How should 12 month salaries be prorated to the academic year? and many more-- need to be discussed and satisfactorily resolved before large research-oriented institutions can exchange comparable salary data. Thus what finally emerges from the exchange in the form of a report is apt to be misleadingly simple. The user of the

information needs to be aware of the definitional problems and how they were resolved in order to gain a feel for what conclusions can be drawn from the data and how strongly they can be stated.

Once the exchange has been conducted through the use of some format, such as given in Table 1, the collected data needs to be aggregated into a summary. Often this work is done by an appointed unit, presumably the unit charged with organizing the exchange and collecting the data. Another approach has grown out of the recognition that every institution has its own unique needs and style of operating and that each would prefer to form their own report from the collected data. Under this approach, the collecting agency would conclude the exchange by providing each institution with a computer tape containing all the salary data collected. Whether the centralized or the decentralized approach is taken, the final summaries would most often take on the appearance of the example pictured in Table 2. Note that in this table, each department's salaries are partitioned into academic year salaries and fiscal year (12 month) salaries and that a third summary is constructed to combine the two types by prorating the 12 month salaries to academic year salaries. Some salary summaries do not provide the third combination and other reports provide only the combined table.

Interpretative Problems

The data in Table 2, rather than being fictitiously devised to mimic the appearance of a departmental salary comparison, is actual data for a discipline represented at most universities

within a small department. Thus this table can be used to demonstrate realistically the problems associated with such data.

An administrator, whether located at the department, college, or university level, on being given such a Table would immediately compare the average salaries for his institution's department with the corresponding average salaries for all the surveyed departments. Such a comparison could lead to an array of as many as twelve plus-or-minus dollar figures. The conclusions drawn from these conflicting figures would largely depend upon the synthesis process used by the administrator to weight and combine these salary overages and shortages. In this respect the process has a subjective element and is subject to all the usual human foibles.

This type of salary comparison poses many pragmatic problems such as what would be done if a department seems to be paying full professors at a rate far higher than the discipline average and yet their assistant professor salaries are so low that they experience recruiting difficulties. The purpose of this paper is not to discuss these types of issues--as interesting as they are--but, rather, to focus on problems of a more technical nature.

The first technical challenge to the foregoing comparison procedure is the claim that the absence of standard deviations for each salary average greatly limits their use. For example, what interpretation can one assign to the comparison of Institution H's 12 month, full professor salary? We see that there are two such professors with an average salary of $39,940, which is very close to the discipline average of $40,347. Many would assume that this comparison indicates the absence of any problem. Other administrators, with a more active imagination or mischievous nature, would

conjecture that perhaps this average salary was comprised of salaries of $50,000 and $30,000, in which case there could indeed be a potential problem. A standard deviation would immediately tell which situation prevailed. The most common response to such a complaint is that in most cases, the number of salaries involved in each average is large enough that a few deviant salaries will not badly skew the average. As we see here, however, if a modest sized department's faculty is partitioned into eight levels, some levels will likely contain only a few entries, and thus be greatly skewed by anomalies.

A more serious challenge to the comparison of salary averages rests on the assumption that faculty salaries are based on far more factors than just "rank", which is the only variable taken into consideration in Table 2. If, indeed, salaries are based in some manner on the cumulative weight of such considerations as merit, time in rank, experience, type of terminal degree and tenure status, then, how can we possibly ignore all these effects and decide the appropriateness of an average salary based on rank alone? Few supporters of salary comparisons would deny the importance of these additional factors in determining salaries but they would answer this question in a manner similar to their response to the first, namely, the effect of all these factors would be nearly washed away by the process of averaging together so many individuals possessing similar characteristics. One suspects that this argument places too much faith in the homogeneity of academic departments, but in the absence of any refuting evidence and, for many, the lack of any ideas for correcting such a sin of omission, this argument usually wins the field.

In the next section, we use a regression analysis in order to inject more information into the comparison of salaries. Further, by contrasting the results of a regression procedure with those derived from the process of comparing averages, we will find that there are many striking incongruities which indicate the flaws in the homogeneity theory.

Regression Analysis

Any comparison procedure becomes impossibly unwieldly once the number of variables exceeds three or four if the analyst is dependent wholly upon his own ability to correctly assign weightings to each variable and calculate a composite value for the many permutations that naturally arise. A regression analysis is essentially a mathematical process devised to handle just such a complex comparison calculation. After the user specifies certain procedural matters, such as the order in which the variables are to be considered and by what criteria their effectiveness is to be gauged, the computer routine quickly finds the specific weights to be assigned to each variable; this results in an equation that best fits the data. Not only does the routine find the solution which is optimal for the initial conditions and constraints but it has an attached statistical structure that provides some probabilistic measure of how certain we can be of the solution and all its constituent parts. If such a procedure possesses so much power, one might wonder why it is not used more often for the type of salary comparisons under discussion. There are several reasons for this, the primary one being the difficulty in obtaining the additional data that one feels has an effect upon faculty salaries.

Until the user is motivated in some way to expend the considerable extra effort required to effect a more detailed exchange of data, it is doubtful if the current state of salary comparisons will change. Such motivation must come from a belief that the results of a regression analysis are much different than the results of a straight forward comparison of average salaries and, what is more, that the regression results are more likely to be correct. This paper is an initial attempt to provide such motivation.

Any proper employment of a regression routine must be preceded by an hypothesis or supposition. Unless the analysis follows a well conceived theme, the results are nearly worthless. In the case at hand, we are concerned with linking faculty salaries with those qualification variables that have a significant effect on salaries. The investigator begins with an unnecessarily large assortment of such variables--some redundant, others irrelevant--in an attempt to avoid missing some important contributing factor. In the process of performing the regression calculations, the analyst can prescribe conditions which will ensure that only the most important variables are retained in the final results. Once we have selected the variables to be used and provided the data to the computer routine, we would expect to see as the solution a mathematical equation of the form:

(equ.1)
$$\text{faculty salary} = C_o + C_1 \cdot (\text{rank}) + C_2 \cdot (\text{terminal degree}) + C_3 \cdot (\text{years in rank}) + \ldots$$

(C_o would be equal to a base salary figure to which additional dollars represented by C_1, C_2, C_3 ... as calculated by the regression program, would be added or subtracted according to the qualifications possessed.

Such an equation would then enable the user to calculate a "predicted" salary for any set of qualification variables. Certain statistical assurances exist to indicate how well these predicted salaries match the actual salaries. Ordinarily, the investigator has established his hypothesis and selected his variables in such a manner that he is inclined to consider a salary predicted by the regression as representing the "proper" or most equitable salary and that its deviation from the actual salary represents a possible abnormality resulting from improper biases. Such a stand requires the strong assumption that all the relevant, valid variables were taken into consideration. In the case of salaries, we cannot take as firm a position because a perfect quantification of "merit" is impossible. Attempts have been made to at least partially capture some aspect of merit by counting papers published and grants received, but the statistical significance of these difficult to obtain measures has varied considerably from study to study. The fact that our regression analysis cannot be perfect, due to the lack of a "merit" variable, should not be very disturbing for, after all, we are only posing this as an alternative to the usual process of comparing average salaries--a process that not only ignores merit but also every other factor except rank!

To someone unacquainted with regression methods, it may seem that faculty salaries are not being compared with each other but, rather, each salary is contrasted with a "predicted" salary that is tailor made by the regression equation. However, beneath all the mathematical machinery a comparison of actual salaries does take place during the construction of the regression equation. In a sense, every faculty member's salary is adjusted to remove

those increments that are due to the various qualifications possessed by the faculty member. Once all the faculty are given identical qualifications and their salaries adjusted correspondingly, they are then compared and the differences are minimized by the regression routine.

Table 3 contains a copy of the survey form used to obtain the salary data that went into developing the salary report shown in Table 2 as well as the additional information needed to run a regression study. Note the difference between Table 1 and Table 3: a regression study requires a data line for each faculty member whereas the standard salary comparison requires a few data elements for only each rank level within a unit.

The raw data obtained from the contributing departments must be considerably altered and rearranged before it can be processed by the standard regression computer program. Table 4 displays the critical elements drawn from the final computer printout. First note that many variables, which were originally considered by the regression routine, were left out of the final equation because they either didn't contribute enough or because the data were statistically erratic. A notation of "yes" in the "significance" column indicates that the variable was accepted into the final equation and the value in the "regression coeff" column is the coefficient in terms of a dollar value assigned to that variable (denoted by the C_1 in Equation 1). Thus, the equation has the form:

Salary=\$15,559+\$6,719.(professor)+\$4,491.(associate professor)+...

The statistical measures concluding the Table indicate how successful we have been in modeling the salary structure. The $r^2 = .86$

says that 86% of all the variance in salaries can be explained by the regression equation. This means that, on average, only 14% of a person's salary is influenced by merit, bias, or other subjective considerations. The standard deviation of $3,270 implies that 95% of the time the predicted salary is within ± $6,540 of the actual salary and 63% of the time within ± $3,270. This is not particularly impressive; however, final judgment should be reserved until we compare it to a corresponding measure for the salary studies based upon a comparison of averages. This, we do next.

Which Comparison Procedure is Best?

In the foregoing we have shown that there is a standard procedure available--regression analysis--which could be used as a replacement for the usual process of evaluating faculty salaries by comparing a department's average salary for each rank with corresponding average salaries collected from peer institutions. Assuming that the two procedures will end in different results, we should, in advance, decide which procedure will be accepted as providing the "best" or most accurate assessment. On first appearances, the regression procedure should best represent the salary structure because it uses more relevant information than does the straight comparison of average salaries; however, many people would prefer to see a more quantitative evaluation of the two procedures before accepting regression analysis as the better of the two. This we now proceed to do.

We assume that underlying the bulk of the salary data there is some rational structure to the salaries within each department.

Although there are certainly some salaries which violate this structure and stand apart as anomalies, most of the salaries will adhere closely to this framework. In addition, continual competition among departments at peer institutions creates an economic force that ensures a close similarity of faculty salary structures across disciplines. Thus a salary model which accurately fits the salary structure existing within a discipline, say chemistry, would enable the analyst to accurately predict the salary for every chemistry professor at every peer institution's chemistry department. Thus, the ability to predict existing salaries is a good measure of how good the analytical model is. Let us apply this test to the two procedures at hand, using chemistry departments as the example in order to ease the discussion.

Comparison of Average Salaries:

This procedure uses the average salary for all chemistry professors at a given rank within peer institutions, as the appropriate salary for a professor at that rank. If we let X_i = i^{th} chemistry professor's salary and $\bar{X}$ = the average salary for all chemistry professors with the same rank, then the prediction error = $(X_i - \bar{X})$. If we square such differences to prevent negative errors being subtracted from positive errors, then

$$\sum \frac{(X_i - \bar{X})^2}{n}$$

is an expression which gives a measure of the "average" error involved in predicting salaries by using average salaries. Applying this to the collected data, a value of $4,842 is obtained.

Regression Procedure:

The data are used to derive an equation which then enables the user to calculate a predicted salary for each faculty member

by using the data variables associated with that faculty member. If we let Y_i = i^{th} chemistry professor's salary and Y_i' = the predicted salary for the i^{th} chemistry professor, then

$$\sum \frac{(Y_i - Y_i')^2}{n}$$

is a calculation measuring the "predicted" salary error in a manner parallel to that used for the other procedure. From the data we obtain a value of $3,270.

Since the "average" prediction error is smallest for the regression procedure we are willing to regard the regression model as the better fit of the two. As a consequence of this, if in the next section we find that the two procedures generate widely differing results, we will accept the regression results as being closer to the "true" assessment.

A Comparison of the Two Procedures

Using the method of comparing faculty salaries to average salaries, we have calculated the average difference for each department, by

$$\sum \frac{(X_i - \bar{X})}{n} .$$

This may be considered the average amount by which each faculty member is under- or over-paid. These figures are listed in Table 5 under the heading "AVG".

Similarly, each faculty salary is compared to the value predicted by the regression method. All these differences are summed and averaged for each department using

$$\sum \frac{(Y_i - Y_i')}{n}$$

and recorded in the same Table under "Residual".

Many striking differences between the two procedures occur. For example, note that for associate professors at Institution A, the regression method indicated they are underpaid by $1,390, but the method using average salaries would judge their salaries to be $954 too high!

Five regression results are marked with an asterisk indicating that these results are statistically significant (at the .05 level). This means that these entries have a particularly high level of creditability. (One should not take this to mean that the other regression values are invalid for, it should be noted, none of the results obtained from the method using average salaries have any formal statistical significance. Most of the departments used in this study were fairly small; a similar study using large departments would probably end in many more regression results being statistically significant.)

Summary

The intent of this study was to compare the conclusions one would draw from looking at average faculty salaries in a specific department with those conclusions evolving from a regression analysis of the same salaries. If one were asked to select beforehand the method which would be expected to produce the most accurate appraisal, from either a statistical or an intuitive viewpoint, most of us would choose the regression analysis. If, however, this free choice was further constrained by pragmatic considerations such as cost and ease of interpretation and explanation, most would change their choice to the use of average salaries. Many feel that any anguish over which method to use is an academic nicety since

the final results of both will be, for all practical purposes, the same; the consensus seems to be that the qualifications of faculty, at a given rank within a given discipline, tend to be quite uniformly distributed over peer institutions. As a result, administrators feel comfortable with this compromise and are inclined to hold with average salaries until it can be shown that the two methods produce glaringly different conclusions.

The results of this study may then come as a surprise to many, for within our test discipline the distribution of faculty qualifications is not uniform across the departments, the difference in qualifications and salaries do not average out when aggregated, and the results of the regression analysis are in some instances drastically different from results derived from average salaries.

Certainly some administrators will be unconvinced by even this demonstration, their claim being that salary averages are not used (or at least not used in the way implied by this paper) to make salary adjustments or to hire new faculty. One would have to argue against this claim, for if average salaries are not used for such purposes, exactly what are they used for? Why do so many agencies and organizations assiduously collect and display these averages? What do affirmative action auditors look at when they review an institution's salary structure? What evidence do administrators use to counter spurious faculty claims of low salaries or, conversely, to bolster their appeals to state legislators for larger salary appropriations?

These results suggest that the comparison of average salaries may lead to completely erroneous conclusions about the adequacy of

an individual's or even an entire department's salary level. The results indicate a need for further study, particularly a study that would use a larger and possibly more homogenous department such as economics or mathematics.

Recommendations

What can be done if further study shows that the usual comparison of average salaries is completely inappropriate? It is too early to begin working on this speculation except to say that the possibility of using regression analysis is not as impractical as it once was or is commonly supposed. A simple exchange among institutions listing only four pieces of data--rank, department, academic year equated salary, and time in rank for each unidentified faculty member--could support a regression analysis that would be far more accurate than the use of average salaries. Experience shows that a very streamlined regression analysis using only these four pieces of data would account for over 90% of the variance in faculty salaries that a far more complex regression study would explain. Most institutions now have developed their faculty data base to the point where printing out such listing by computer would be a very cheap and easily done task. As long as faculty salaries are not linked with names, the concern for confidentiality--always the major argument voiced against such proposals for detailed salary data exchanges--would not arise. In the past, the incentive for inquiring into the validity of using average salaries was considerably dimmed by the supposition --perhaps true--that very little could be done to correct the situation if it did appear to be in need of change. Now, however, most of the obstacles that formerly stood in the way of more detailed

data exchanges have been removed. The way stands open for comparison by regression methods--if they prove to be necessary. This paper suggests that regressions may indeed be necessary; others are urged to further this investigation.

Table 1

UNIVERSITY OF
DEPARTMENTAL AVERAGE SALARIES
1980-81

Department Title _____

H.E.G.I.S. Code _____

Dept. or Acct. No. _____

9- to 10-Month Faculty				
Rank	Cash Salary			Full-Time Equivalents
	High	Low	Average	
Professor	47,600	32,400	34,596	1.2
Associate Professor				
Assistant Professor				
Instructor				
Total	47,600	32,400	34,596	1.2

11- to 12-Month Faculty				
Rank	Cash Salary			Full-Time Equivalents
	High	Low	Average	
Professor	54,950	29,050	42,724	13.1
Associate Professor	30,400	29,500	29,836	1.0
Assistant Professor	26,850	24,850	25,467	1.4
Instructor				
Total	54,950	24,850	40,334	15.5

Table 2

Comparative Salary Study for the Department of _____

12 Month Appointments

Institution	Prof	FTE	Asc Prof	FTE	Ast Prof	FTE	Instr	FTE
A	39,697	7.0	33,340	1.0				
B	39,306	16.0	30,758	6.0	22,363	4.0		
C	35,401	1.0	25,333	6.0	21,560	10.0		
D	38,625	1.0						
F								
G								
H	39,940	2.0	31,967	3.0	26,428	12.0		
I								
J	44,128	6.16			26,000	1.0		
K	40,946	9.0	25,468	2.0	22,512	5.0	19,023	2.0
All Institutions	40,347	42.16	28,707	18.0	23,773	32.0	19,023	2.0

Academic Year Appointments

Institution	Prof	FTE	Asc Prof	FTE	Ast Prof	FTE	Instr	FTE
A	36,146	25.0	26,143	7.0	19,608	13.0		
B	34,200	1.0	23,750	1.0	22,100	1.0		
C	30,725	2.0						
D	32,100	3.0	26,090	5.0	22,160	5.0	30,000	1.0
F	31,900	1.0			21,833	3.0		
G	35,200	1.0	26,000	1.0	22,800	1.0		
H	31,626	9.0	24,420	2.0	21,540	5.0	20,430	1.0
I	34,933	3.0	23,979	2.0	21,750	2.0	20,000	1.0
J	36,275	29.2	26,874	4.0	20,095	3.25		
K	31,994	6.0	25,118	3.0	18,938	3.0		
All Institutions	34,945	80.2	25,714	25.0	20,676	36.25	23,477	3.0

All Salaries Equated to an Academic Year

Institution	Prof	FTE	Asc Prof	FTE	Ast Prof	FTE	Instr	FTE
A	35,186	32.0	26,209	8.0	19,608	13.0		
B	31,607	17.0	24,484	7.0	18,732	5.0		
C	29,924	3.0	20,267	6.0	17,248	10.0		
D	31,800	4.0	26,090	5.0	22,180	5.0	30,000	1.0
F	31,900	1.0			21,833	3.0		
G	35,200	1.0	26,000	1.0	22,800	1.0		
H	31,685	11.0	25,112	5.0	21,259	17.0		
I	34,933	3.0	23,979	2.0	21,750	2.0	20,000	1.0
J	36,082	35.4	26,874	4.0	20,261	4.25		
K	32,461	15.0	23,220	5.0	18,357	8.0	15,218	2.0
All Institutions	34,025	122.36	24,440	43.0	19,899	68.25	20,173	5.0

FACULTY SALARY SURVEY

UNIT/DEPARTMENT _____
INSTITUTION _____
RESPONDENT _____
PHONE ( ) _____

Faculty Member's Initials	Rank[2]	eff. 4/1/80 Current Salary FY 1979-80 12 Mos	10 Mos	Tenure System Appt. yes	no	depts/units appointed to and % of salary paid by each dept	%	Terminal Degree type	yr of award	years at institution	years in current rank	years total experience	Administrative Title (if any)
C.K.	1	48,756		X			100	Ph.D.	1946	33	30	38	
D.B.	1	38,474		X			100	M.A.	1953	7	7	23	
J.S.	1	49,101		X			100	Ph.D.	1956	24	21	26	Director
F.M.	1	40,545		X			100	Ph.D.	1957	28	13	34	
D.K.	1	42,381		X			100	Ph.D.	1954	23	17	26	Assoc. Director
M.M.	1		25,949	X			100	Ph.D	1970	11	01	11	
S.M.	1		35,343	X			100	Ph.D.	1952	31	20	31	
T.P.	1	40,596		X			100	Ph.D.	1959	13	13	15	
B.B.	1	37,740		X			100	M.A.	1963	23	13	25	
N.V.V.	1	28,101		X			100	M.A.	1965	15	03	15	
J.M.	2	31,100		X			100	M.A.	1973	06	01	06	
J.S.	2	29,835		X			100	M.A.	1966	12	02	18	Assoc. Director
B.W.	2		22,185	X			100	Ph.D.	1972	09	04	09	
R.B.	3	25,730		X			100	Ph.D.	1977	04	04	04	Assoc. Director
T.C.	3	23,894		X			100	M.A.	1975	04	01	04.5	Act. Assoc. Dir
G.D.	3		17,810	X			100	Ph.D.	1979	01	01	01	
C.M.	3	20,655		X			100	M.S.	1976	01.5	01	02	

Table 3

TABLE 4

Statistical Details of the Regression of Salaries with Selected Variables

Regression Variable	Mean Value	Standard Deviation	Significant at .05 Level	Regression Coefficient	Standard De of Coefficie
Salary	30,828	8205			
Professor Rank	.54 (54%)	.50	Yes	6719	1171
Associate Professor Rank	.18 (18%)	.38	Yes	4591	964
Assistant Professor Rank	Base (28%)	.41	-		
12-Month Appointment for:					
Professor	.36 (36%)	.48	Yes	3833	701
Associate Professor				3609	1156
Assistant Professor				4373	1063
10-Month Appointment	Base (64%)	-	-	-	-
Tenure system Appointment for:					
Professor	.91 (91%)	.29	No		
Associate Professor					
Assistant Professor					
Temporary Appointment	Base (9%)	-	-	-	-
Ph.D.	.78 (78%)	.42	Yes	2618	747
Professional Degree	.04 (4%)	.21	No		
Masters Degree	Base (18%)	-	-	-	-
Years since award of terminal degree	13.8	10.25	Yes	499	116
(")^2	295.0	355.2	Yes	- 8.6	- 2.7
Years at the current institution	12.1	8.8	Yes	- 155.7	55.1
(")^2	222.6	278.1	No		
Years in current rank of Professor, Associate Professor, Assistant Professor	7.7	6.7	Yes (full Prof. only)	267	20.9
(")^2	101.9	160.0	No		
Years of total experience	12.0	11.8	No	- 152	60
(")^2	266.9	384.7	Yes	5.0	1.2

TABLE 4, continued

Statistical Details of the Regression of Salaries with Selected Variables

Regression Variable	Mean Value	Standard Deviation	Significant at .05 Level	Regression Coefficient	Standard De of Coefficie
Service in an Administrative position	.11 (11%)	.31	Yes	4378	763
Non-administrator	Base	-	-	-	-
INSTITUTION BY RANK					
None significant except:					
Institution Rank					
A Professor	.14 (14%)	.35	Yes	4027	1044
C Professor	.01 (1%)	.11	Yes	-4341	1996
D Asst. Prof.	.02 (2%)	.15	Yes	4268	1645
F Professor	.004 (.4%)	.07	Yes	-8149	3381
H Asst. Prof.	.08 (8%)	.27	Yes	3733	1019
Constant				15,559	1042

r^2 = .86

std. deviation = $ 3270

Table 5

Contrast of Two Methods for Comparing Salaries -
Using Average Salaries (Table 1) and Regression Residuals (Table 4)

Institution	PROF. Residual	PROF. Avg.	ASSOC. Residual	ASSOC. Avg.	ASST. Residual	ASST. Avg.
A	$ 4027*	$ 796	$-1390	$ 954	$ 538	-$ 1068
B	- 397	-1023	311	1477	871	- 843
C	-4340*	-4583	- 2354	-3374	- 936	- 2213
D	- 900	-2564	605	376	4268*	1504
F	-8149*	-3045			554	1157
G	1309	255	2689	286	2372	2124
H	-1204	-2790	1351	1438	3732*	2128
I	-3253	- 12	- 2849	-1735	184	1074
J	619	1757	- 1350	1160	- 521	80
K	564	- 821	- 158	-1653	- 949	- 1440

* statistically significant residuals

avg. = difference between department average salary and the average of all departments

$$= \frac{\sum \text{dept. salaries}}{\text{faculty in dept.}} - \frac{\sum \text{all salaries}}{\text{total faculty in study}}$$ (with 10 and 12 month salaries weighted appropriately)

Residual = average residual for the department = $\frac{\sum \text{residual}}{\text{faculty in dept.}}$

$$= \frac{\sum (\text{actual salary} - \text{predicted salary})}{\text{faculty in dept.}} = \frac{\sum \text{actual salary}}{\text{faculty in dept.}} - \frac{\sum \text{predicted salary}}{\text{faculty in dept.}}$$

= (dept. average actual salary) - (dept. average predicted salary)